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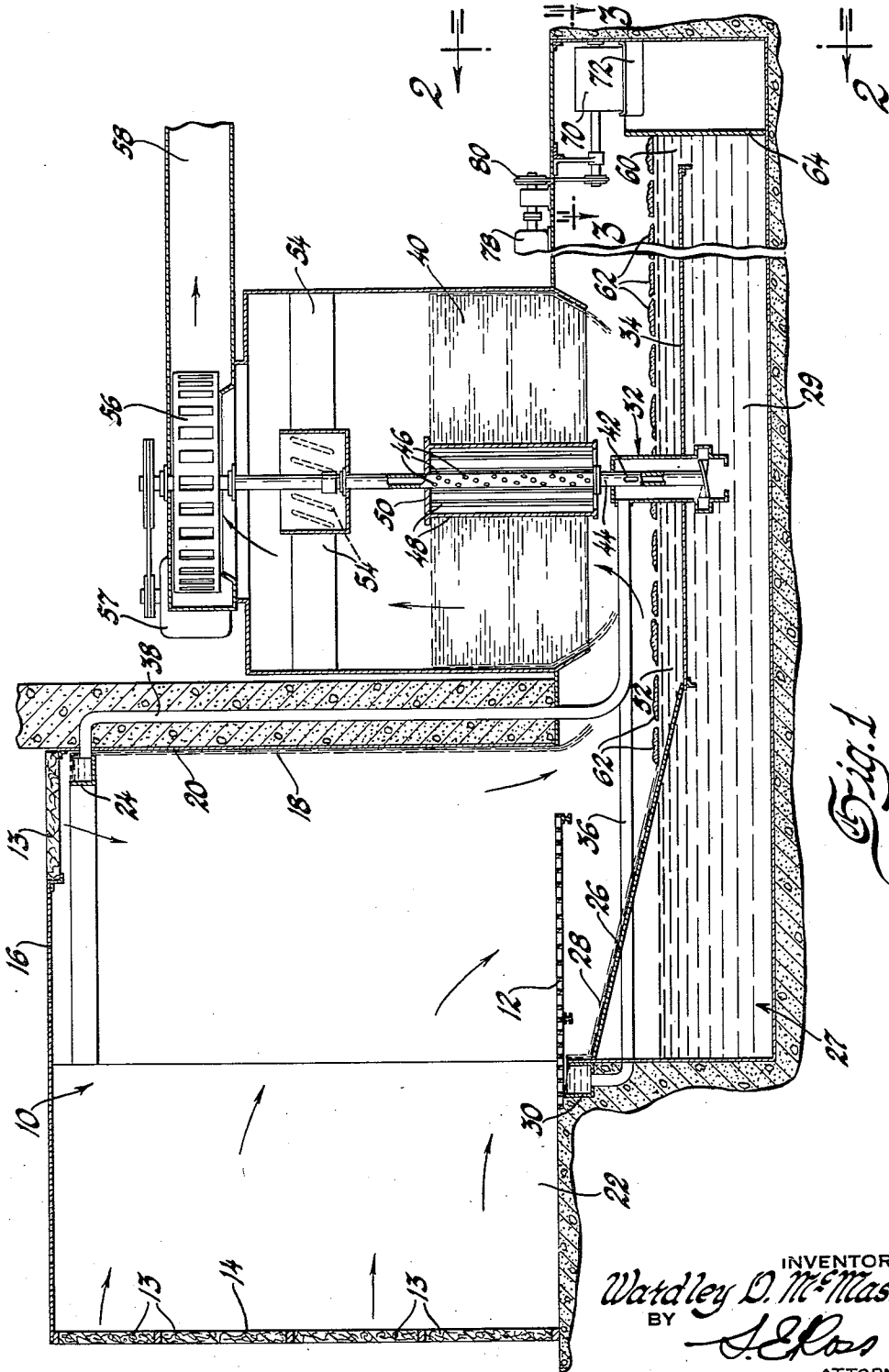
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SPRAY BOOTH

Filed July 27, 1953

2 Sheets-Sheet 1



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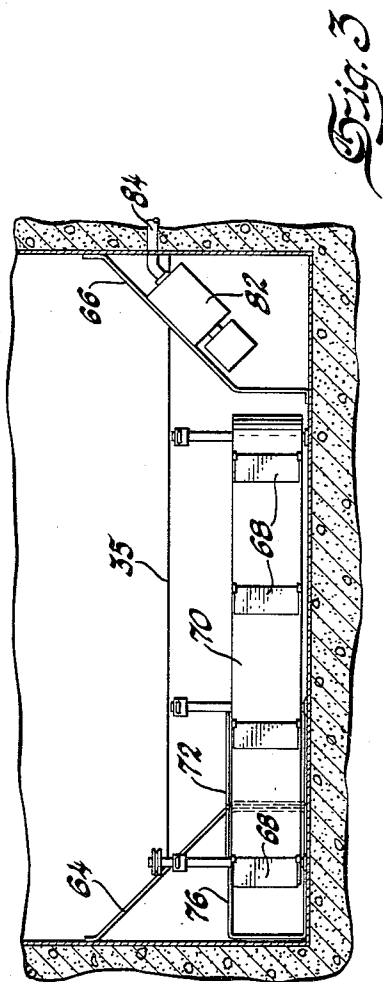
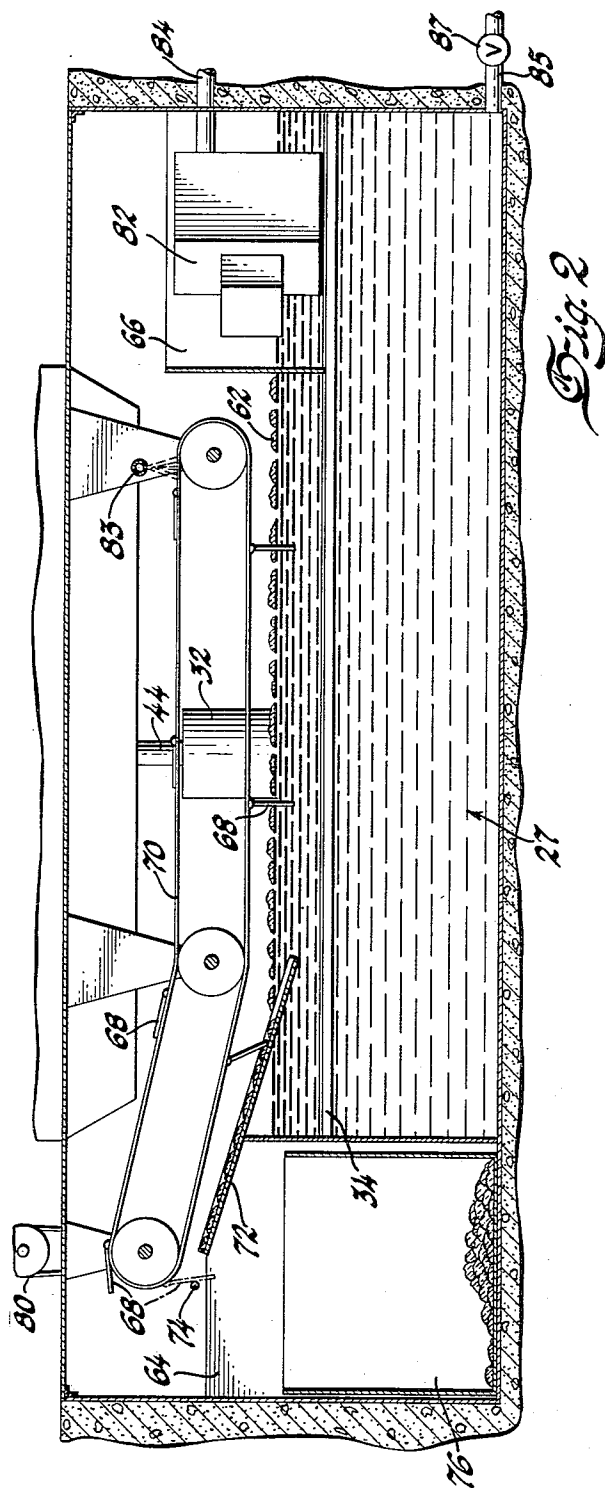
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2,805,844

SPRAY BOOTH

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3 Claims. (Cl. 261—3)

This invention relates to improvements in spray coating operations and more particularly to an improved spray coating booth and its operation.

Spray coating objects with paint, lacquer, ceramic compositions, etc., is a well-known industrial process. In most instances the spray coating operation is conducted in a specially built spray chamber or spray booth. These spray booths are usually provided with a liquid wash means to entrap the excess coating particles and thereby remove them from the chamber. In a typical prior spray booth, such a liquid wash comprises a "waterwall" or liquid curtain flowing over one wall of the booth. Frequently the booths also have means for withdrawing the air from the spray chamber toward or through the liquid curtain to facilitate removal of the coating particles carried in the air. The object to be spray coated in such a booth is positioned between the spray operator and the water curtain, the excess coating particles in the air being drawn against the water curtain and entrapped therein.

However, in many instances these prior spray booths have proved to be unsatisfactory in operation. Not only has the entrapment of coating particles been relatively inefficient, but there has been little or no thought given to the removal of the coating particles from the water after they have been entrapped therein. As a result, the coating particles coalesce into a sticky residue and sink to the bottom of the apparatus, thus necessitating frequent expensive stoppages for scraping and cleaning. Moreover, in prior spray booths the water used to form the particle-entrapping curtain becomes contaminated with the coating residue, thereby reducing the effectiveness of the curtain and depositing the sticky coating residue throughout the apparatus.

A principal object of the present invention is to avoid the aforementioned difficulties in spray booth operation. A further object is to provide a spray booth which permits the efficient removal of coating particles and the recirculation of the wash liquid. A further object is the provision of an improved spray booth which permits the continuous removal of spray coating particles as well as the purification and recirculation of the wash water.

These and other objects and advantages will appear more fully from the following description of the invention taken in connection with the accompanying drawings, in which:

Fig. 1 is a somewhat schematic elevational view, partially in section and with parts broken away of a spray booth embodying the invention;

Fig. 2 is a view taken along the lines 2—2 of Fig. 1; and

Fig. 3 is a view taken along the lines 3—3 of Fig. 1.

The objects of the present invention are accomplished by providing a spray booth having a liquid reservoir associated therewith in which there is established a rapid positive unidirectional flow of all the liquid carrying the paint or other coating residue to a continuous sludge removal means adapted to remove the coating residue from the liquid, and means to withdraw the thus purified

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liquid for recirculation to the spray chamber. In practice, the continuous sludge removal means comprises a conveyor system disposed at a location where the circulating liquid has become relatively quiet or stagnant while the residue is still floating.

A preferred embodiment of the invention achieves a rapid unidirectional liquid flow away from the spray compartment to the continuous sludge removal means by providing, in the liquid reservoir, a horizontal partition which serves to divide the reservoir into an upper chamber and a lower chamber. The partition extends longitudinally from the spray chamber discharge to a relatively stagnant location where the liquid turbulence is at a minimum. As a result, the liquid discharged from the spray chamber and the air scrubbing spray is drawn rapidly along the floor of the upper chamber toward the sludge removal conveyor. After the coating residue has been skimmed off the surface of the liquid, the liquid is then withdrawn from beneath this location and recirculated.

Referring more particularly now to the drawings, in Fig. 1 is shown an elevational view of a spray booth in accordance with a preferred embodiment of the invention. The apparatus comprises a liquid reservoir 27, a spray chamber indicated generally at 10 having a perforated floor 12, an end wall 14, side walls 22 and ceiling 16. Air is drawn into the spray chamber 10 through air filters 13 provided in the wall 14 and ceiling 16. A liquid curtain 18 is provided around three walls of the spray compartment. This curtain 18 is formed by an overflow of liquid toward the back wall 20 and side walls 22 from a generally U-shaped trough 24 located adjacent the side walls 22 near the ceiling 16. Beneath the perforated floor 12 is a slanting floor 26. This floor is provided with a liquid curtain 28 from a U-shaped trough 30. The liquid curtains 18 and 28 are both supplied by a propeller type pump 32 which withdraws liquid from a lower chamber 29 beneath a longitudinally extending horizontal partition 34 in the reservoir 27 and pumps it to the aforementioned troughs through pipes 36 and 38.

The propeller pump 32 also provides a cascade zone 40 of high intensity liquid spray by forcing the intake water through an opening 42 in the hollow shaft 44 and thence through a multiplicity of shaft apertures 46. The water is drawn up through the hollow shaft 44 and is forced through the apertures 46 as the shaft 44 rotates thus causing the liquid to strike bars 48 of a rotating cage 50 to generate a high intensity water spray which scrubs coating particles from the circulating air drawn through it from the spray compartment.

In operation, air and spray coating particles are drawn downwardly out of the spray compartment into a zone of rapidly unidirectionally moving liquid, indicated generally at 52, where the coating particles coalesce into a residue or sludge 62. Although the liquid curtains 18 and 28 discharge into this zone, a positive unidirectional liquid flow is provided to minimize any turbulence and splashing which otherwise might be encountered.

The air withdrawn from the spray compartment 10 is drawn upwardly through a high intensity air scrubbing liquid spray 40 which removes the coating particles carried by the air. The air then passes through a baffle 54 and is exhausted to the atmosphere through an exhaust vent 58 by a blower 56 driven by a motor 57.

Thus far it will be appreciated that the spray booth provides a positive unidirectional flow of all the wash liquid away from the spray compartment and that all of the spray coating particles entrapped by the liquid curtains 18 and 28 are carried down to join this unidirectional flow.

The rapid unidirectional flow of liquid continues to a sludge removal zone indicated at 60. This location is of sufficient distance from the spray chamber 10 so that

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the liquid is relatively quiet or stagnant to permit efficient operation of the continuous sludge removal means. The floating residue 62, guided by baffles 64 and 66, as shown in Fig. 3, is taken off the surface of the liquid by paddles 68 which are hinged on an endless conveyor 70. The conveyor 70 is driven by a motor 78 through a reduction gear system indicated generally at 80. As shown in the drawings the direction of movement of the conveyor 70 is substantially at right angles to the direction of liquid flow. As a result, the floating residue is guided directly into the proper position for pickup by the paddles 68. As shown in Fig. 2, the paddles draw the floating residue up an inclined sheet 72. As the freely hinged paddles reach the top of this sheet they swing against a strike pin 74 and deposit the coating residue in a container 76. The paddles 68 are sprayed with liquid from a nozzle 83 before they dip into the sludge to prevent the sludge from sticking to the otherwise dry paddle surface. After the floating residue has been removed, the liquid is drawn under the horizontal partition 34 by the circulating pump 32 and is recirculated.

Since the large volume of liquid required for proper spray booth operation is continuously recirculated, there is no need for a constant liquid replenishment. However, since it is desirable to maintain a constant liquid level and since in a large installation evaporation and leakage may otherwise reduce the level, an automatic float valve indicated generally at 82 is provided to control liquid intake through an inlet pipe 84. The reservoir 27 may be drained through an outlet pipe 85 provided with a valve 87.

While it will be understood, of course, that the dimensions and proportions of the spray booth will depend upon the particular installation, I have found that superior results are obtained by so positioning the longitudinally extending horizontal partition 34 in the water reservoir 27 that the depth of the water beneath the partition is at least 3 times the maximum depth of the water above the false floor. In a particular application, excellent results have been obtained by regulating the flow of water to provide a depth of about 3 or 4 inches above the false floor 34.

Various changes and modifications of the embodiments of the invention described herein may be made by those skilled in the art without departing from the spirit and principles of the invention.

What is claimed is:

1. A spray booth comprising the combination of a spray compartment having means therein for providing at least one generally vertical liquid curtain adapted to entrap coating particles, air scrubbing means, a liquid reservoir adapted to receive the discharge from said curtain and air scrubbing means, said liquid reservoir having a longitudinally extending horizontal imperforate metal partition dividing said reservoir into upper and lower chambers, and a circulating pump, said pump having its intake positioned in said lower chamber to thereby cause liquid discharging from said spray chamber and air scrubbing means to assume a rapid unidirectional flow to said pump intake, said air scrubbing means comprising a rotatable hollow shaft extending through and coaxial with a rotatable cage having a plurality of spaced strike bars located radially outwardly of said shaft and generally parallel thereto, said shaft being provided with a plurality of apertures in its walls, said shaft extending vertically upward from said pump inlet in said liquid reservoir for conveying liquid from said lower chamber to said apertures whereby rotation of said shaft generates a high intensity horizontal liquid spray which contacts said strike bar and removes coating particles from air circulated from said spray chamber upwardly through said horizontal spray.

2. A spray booth comprising a spray chamber having means to provide a liquid curtain over walls thereof, said chamber having a perforated floor and an imperforate

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inclined false floor beneath the perforated floor, and an elongated liquid reservoir having one end also disposed beneath said perforated floor and adapted to receive the discharge from said liquid curtain, said false floor extending into said reservoir and terminating beneath the liquid therein, said reservoir having means to rapidly convey said discharge in a unidirectional movement to a relatively stagnant location at the end of said reservoir opposite the end over which said spray chamber is located and at an appreciable distance therefrom, said means comprising a substantially horizontal partition beneath the surface of the liquid in the reservoir extending from the false floor of said spray chamber to said stagnant location and dividing said reservoir into upper and lower chambers, said partition being spatially separated from the end wall of said reservoir at said stagnant location to permit the liquid in said upper chamber to flow to said lower chamber only at said stagnant location, and a liquid circulating pump having an intake beneath said partition at an appreciable distance from said stagnant location to thereby cause said unidirectional liquid flow away from said spray chamber above said partition and liquid flow in the opposite direction beneath said partition between said inlet and said stagnant location, said reservoir also having means at said stagnant location to continuously remove residue entrapped by said liquid curtain.

3. A spray booth comprising, in combination, a spray chamber having means to provide a continuous water curtain over walls thereof, said chamber having a perforated floor and an imperforate inclined false floor beneath the perforated floor, said false floor having means associated therewith to provide a continuous water curtain thereon, an elongated water reservoir having one end located beneath said perforated floor and adapted to receive the discharge from said water curtains, said false floor extending into said reservoir and terminating beneath the water therein, said reservoir having means to rapidly convey said discharge in a unidirectional movement to a relatively stagnant location at the end of said reservoir opposite the end over which said spray chamber is located and at an appreciable distance therefrom, said means comprising a horizontal partition beneath the surface of the water in the reservoir extending from the false floor of said spray chamber to said stagnant location and dividing said reservoir into upper and lower chambers, said partition being connected to said false floor and to the side walls of said reservoir, the depth of the water beneath the partition being at least three times the maximum depth of the water above said false floor, said partition being spatially separated from the end wall of said reservoir at said stagnant location to permit the water in said upper chamber to flow to said lower chamber only at said stagnant location, and a water circulating pump having an intake beneath said partition between said stagnant location and the false floor of said spray chamber, said intake being located at an appreciable distance from said stagnant location to thereby cause said unidirectional water flow above said partition away from said spray chamber and water flow in the opposite direction beneath said partition between said inlet and said stagnant location, said reservoir also having means at said stagnant location to continuously remove residue entrapped by said water curtains, said residue-removing means comprising a conveyor positioned above the water in said reservoir at a location where said water is flowing from said upper chamber to said lower chamber, said conveyor being disposed for operation in a direction generally perpendicular to the direction of flow of said liquid, said conveyor being provided with hinged paddles adapted to skim floating residue from the surface of the water above said partition, and a horizontally distributed water spray located over said reservoir at a location above said pump inlet through which air is drawn after it leaves the spray chamber, the water from said horizontally distributed

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water spray discharging into the upper chamber of said reservoir at an appreciable distance from said stagnant location.

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